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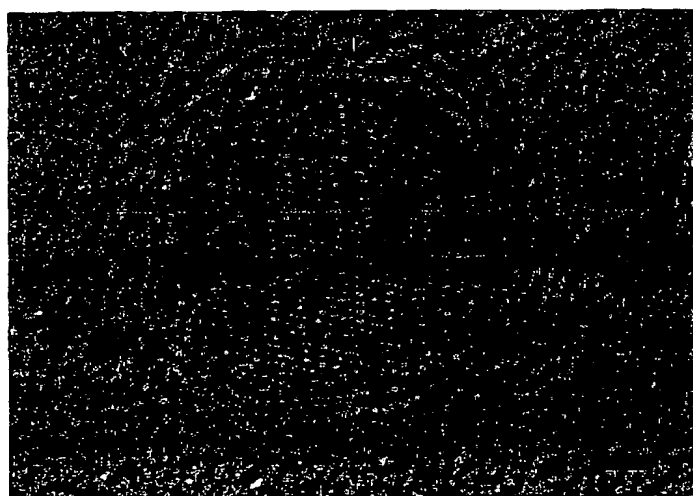
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[Continued on next page]

(54) Title: MICROPARTICLES AND METHODS FOR THEIR PRODUCTION



(57) Abstract: Microparticles having a metal-containing core encapsulated in a graphitic shell containing hetero atoms are made by forming, in a liquid medium, colloidal particles containing a metal-oxo species of Fe, Co, Ni and Pd, colloiddally stabilized by a surfactant and containing source material of carbon and the hetero atoms. These particles are pyrolyzed in inert gas to yield the microparticles. In an alternative method, silica gel coated particles are formed by colloiddally stabilizing particles containing metal species and forming silica at the boundary of the stabilized particle.

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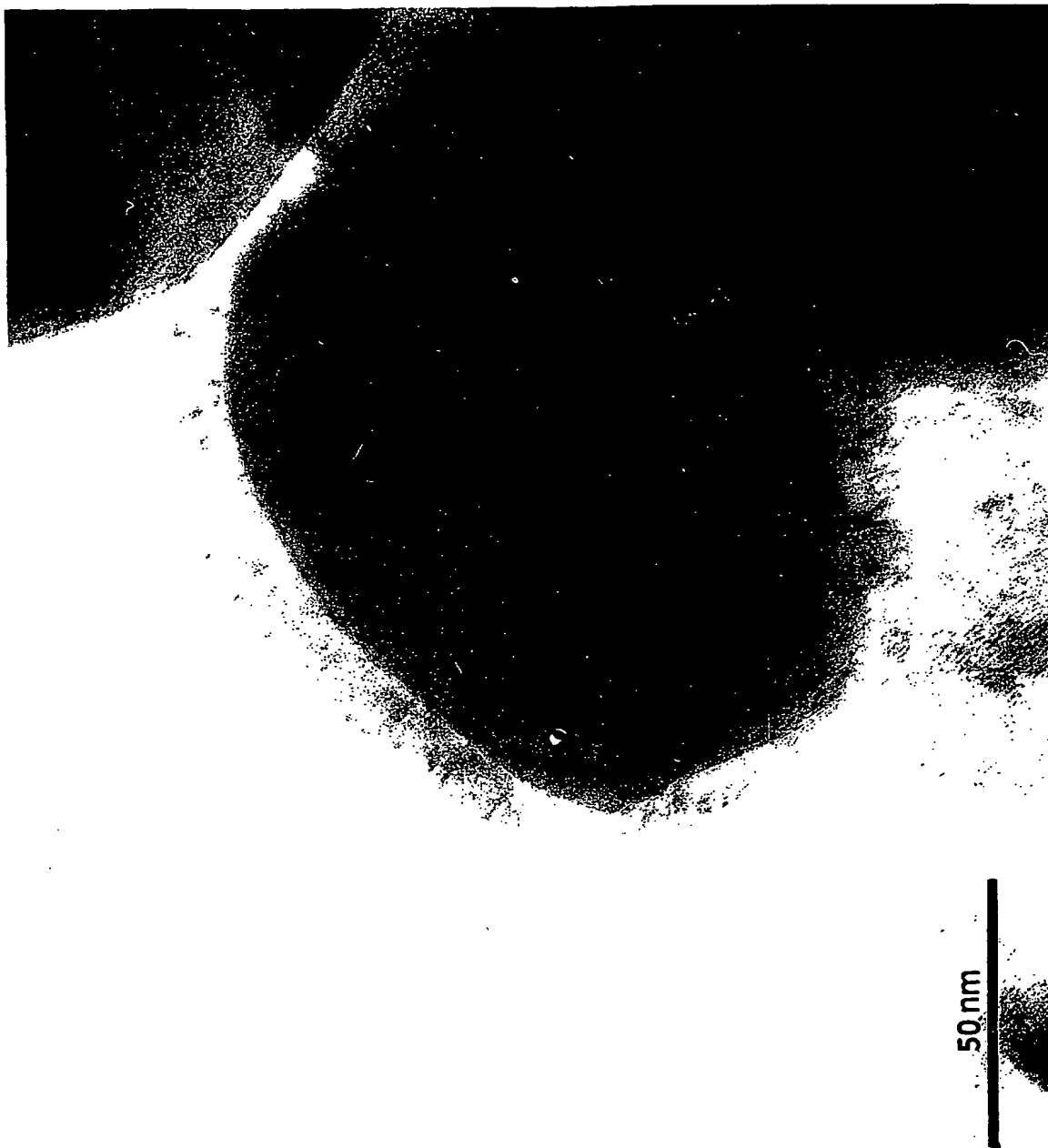
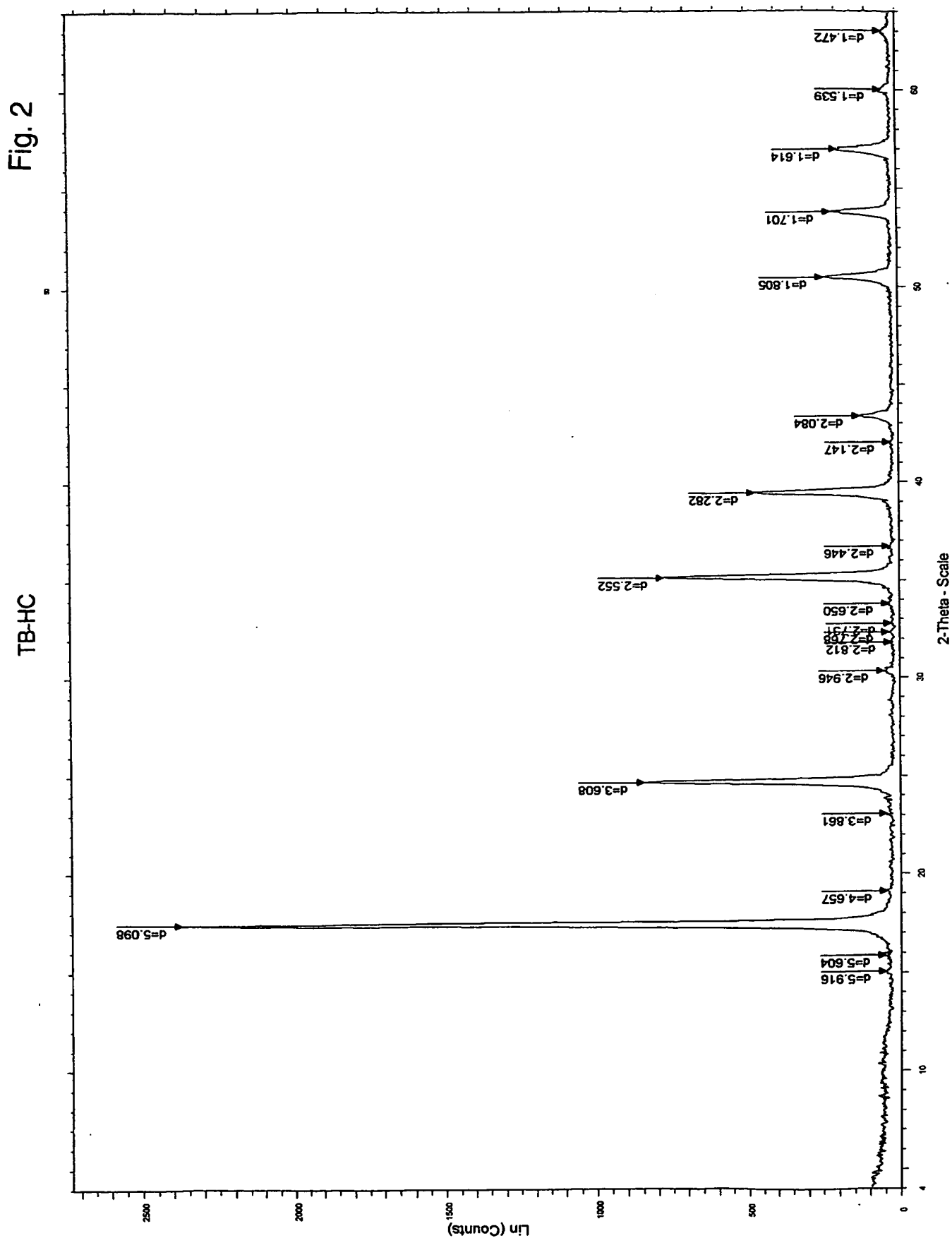


Fig. 1

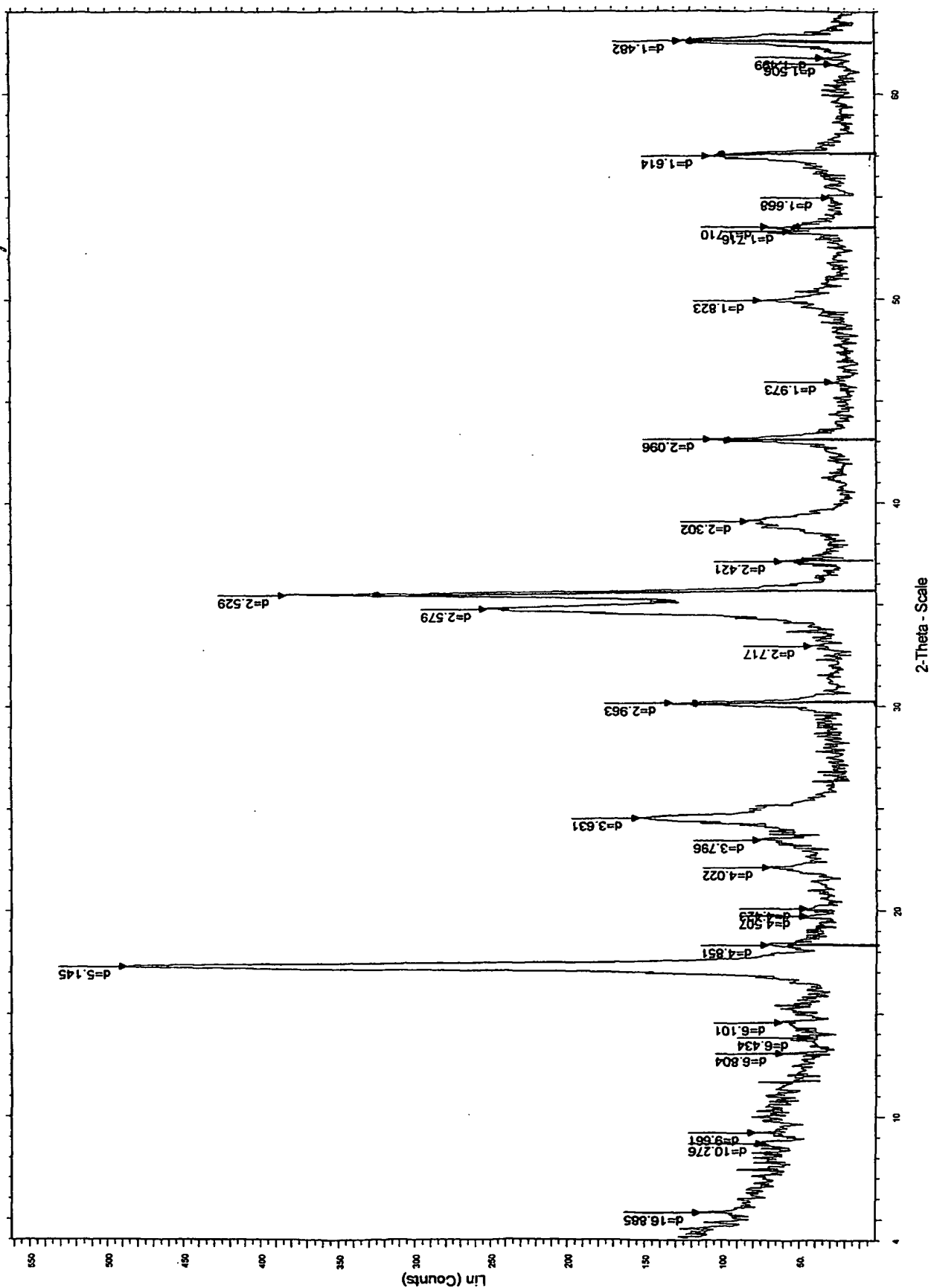
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Fig. 3

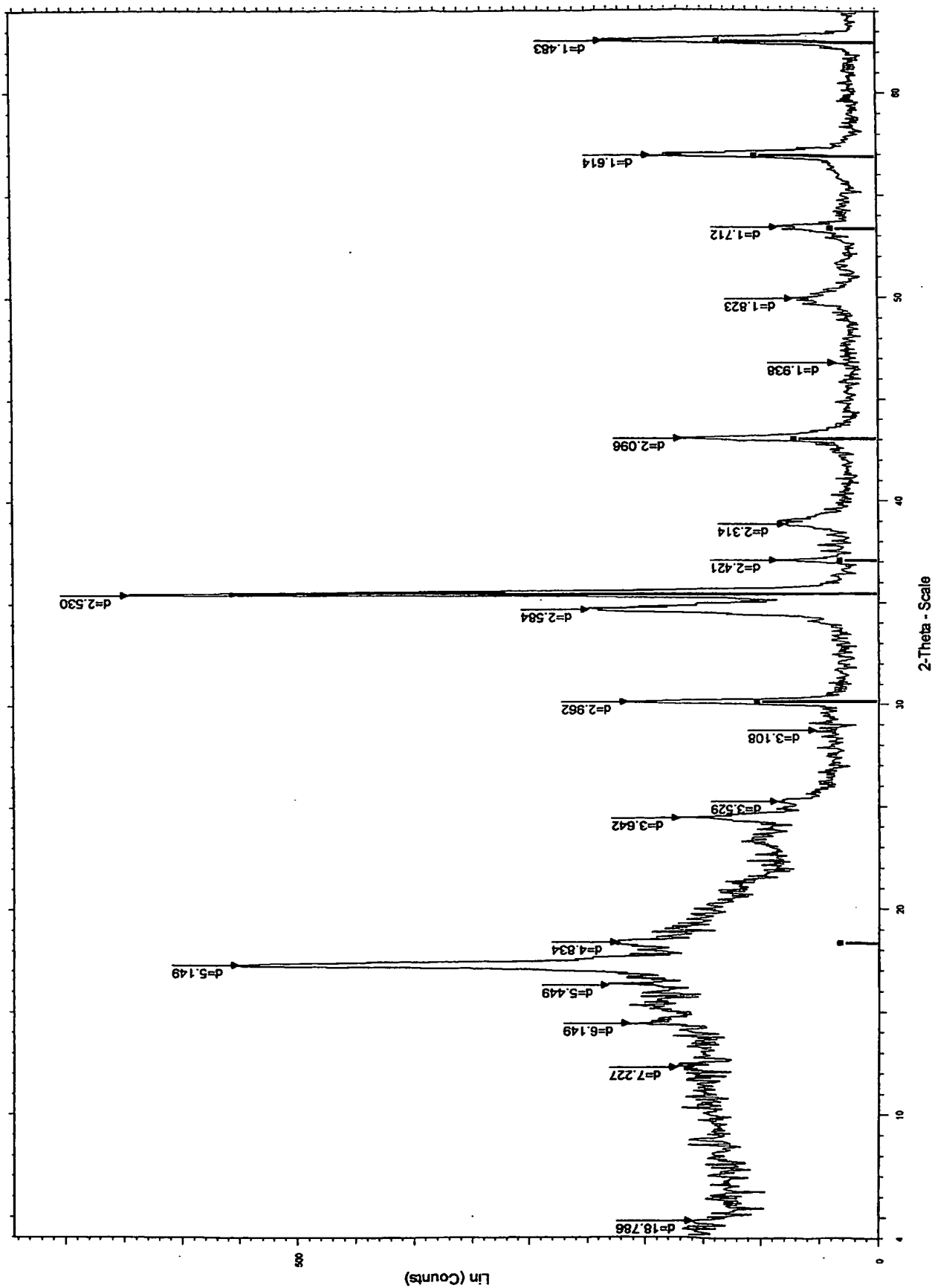
NANO-5-Fe-Product



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Fig. 4

N-1-Fe/HC



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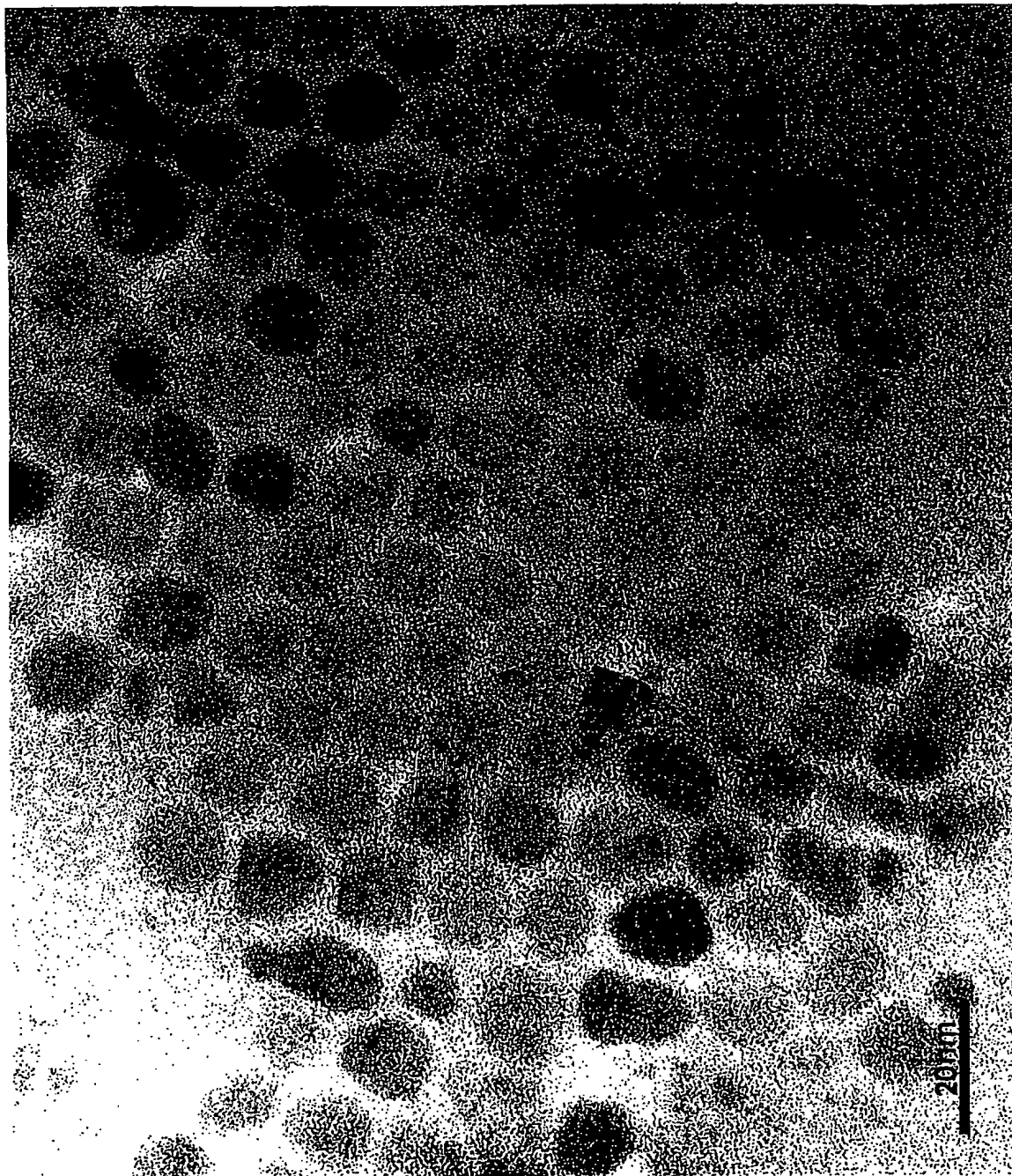


Fig. 5

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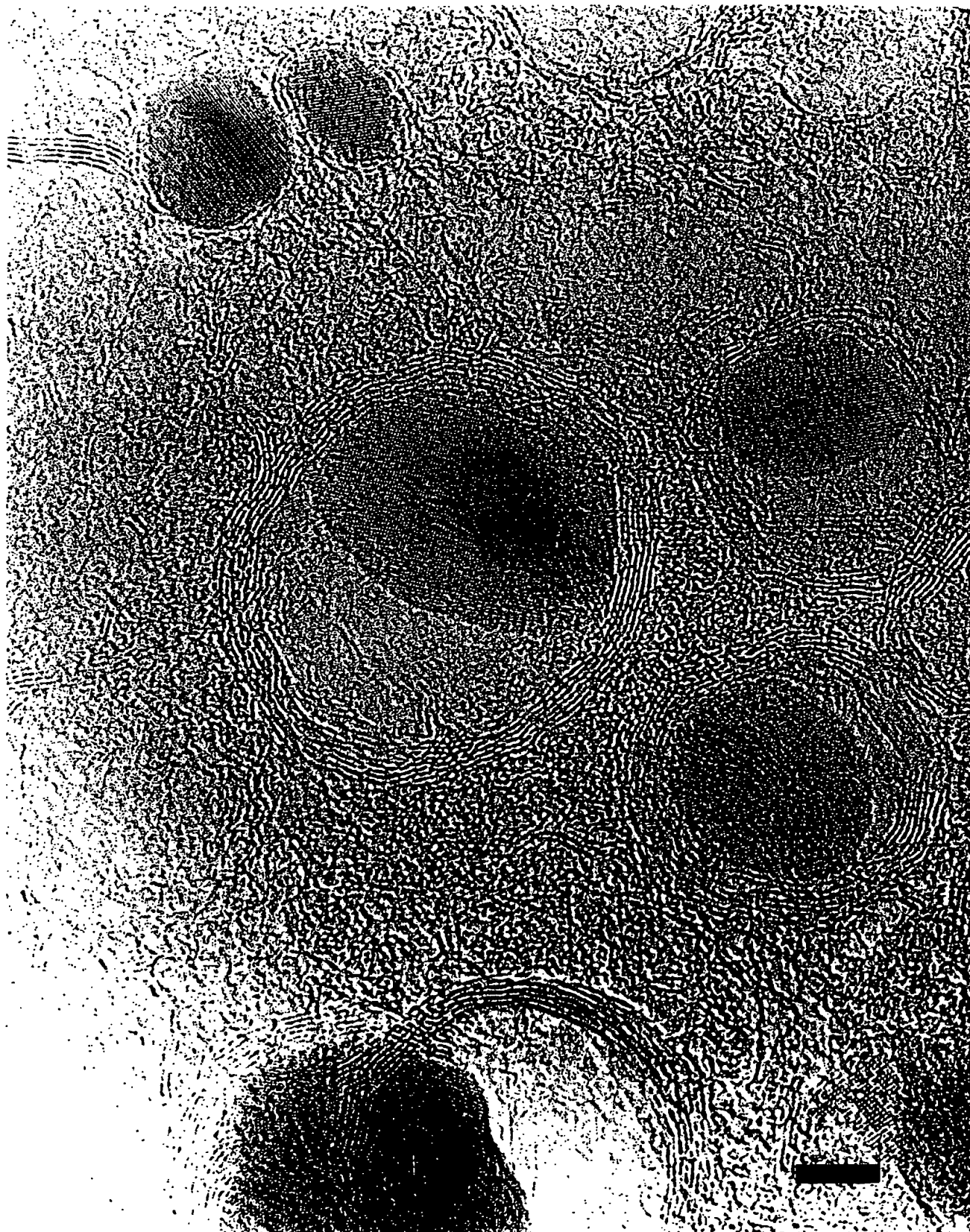


Fig. 6a

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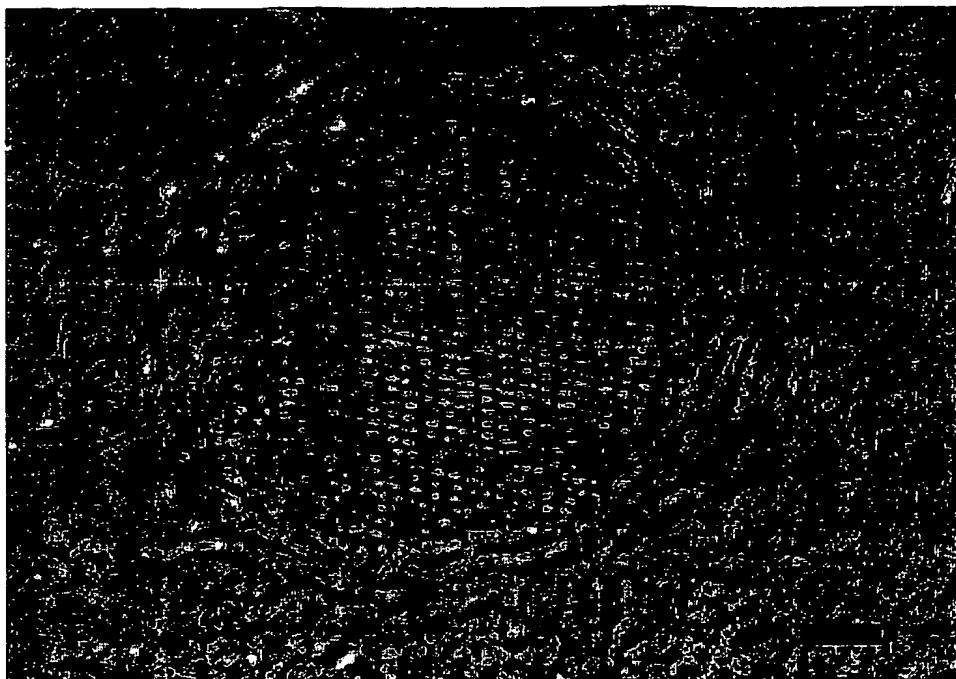


Fig. 6b

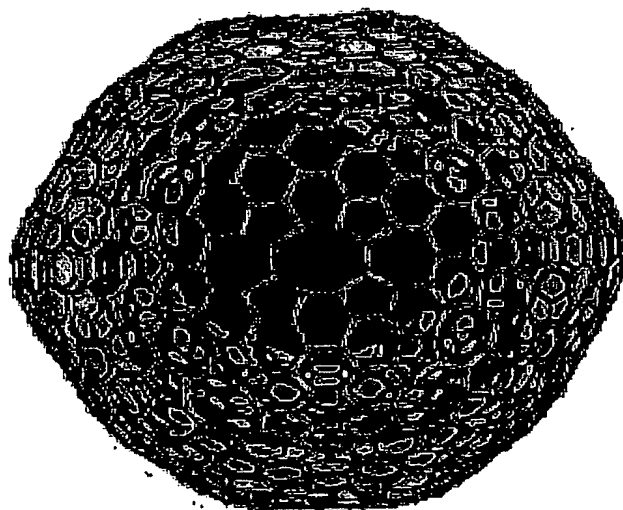


Fig. 6c

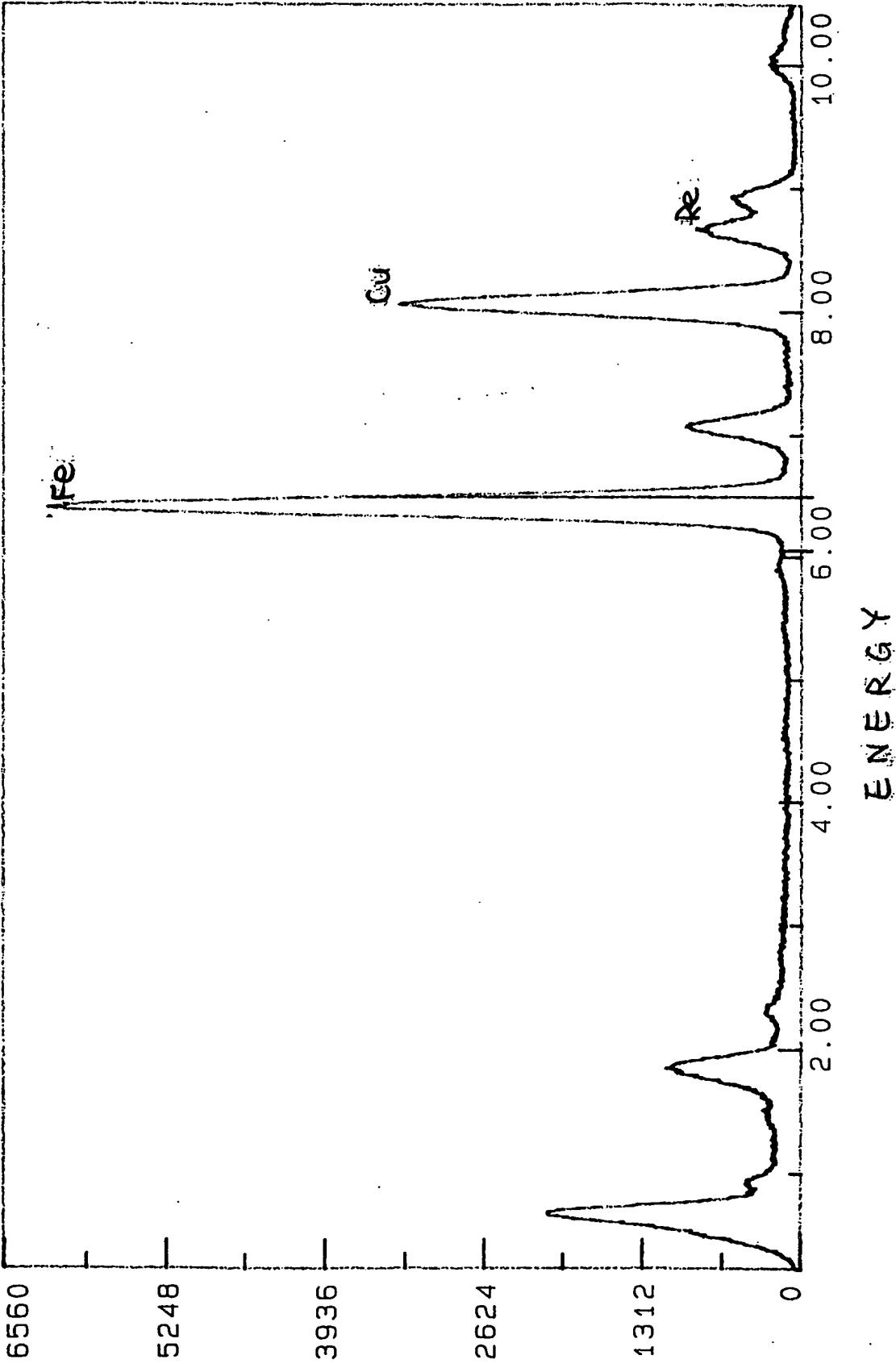


Fig. 7

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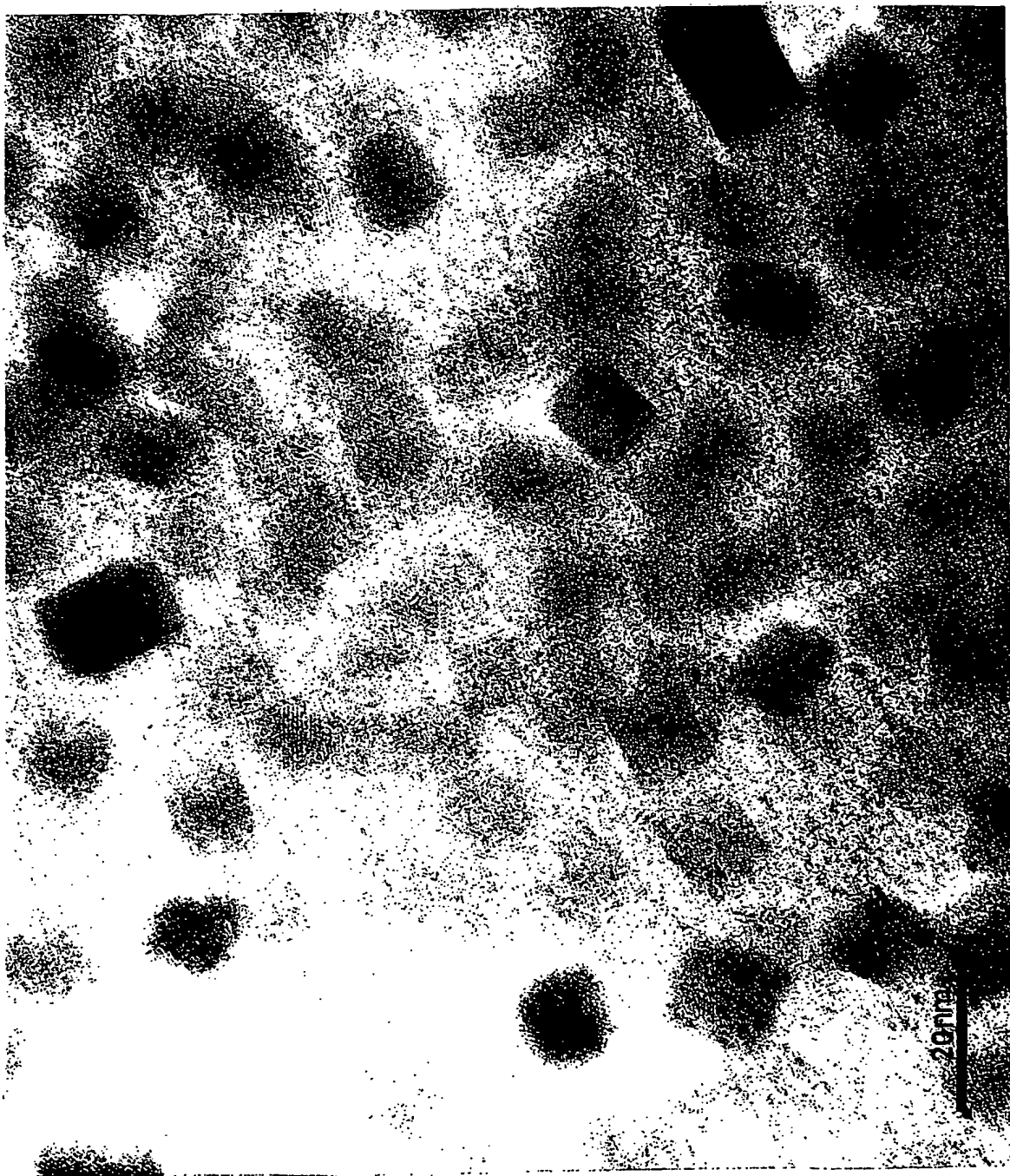


Fig. 8

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Fig. 9a

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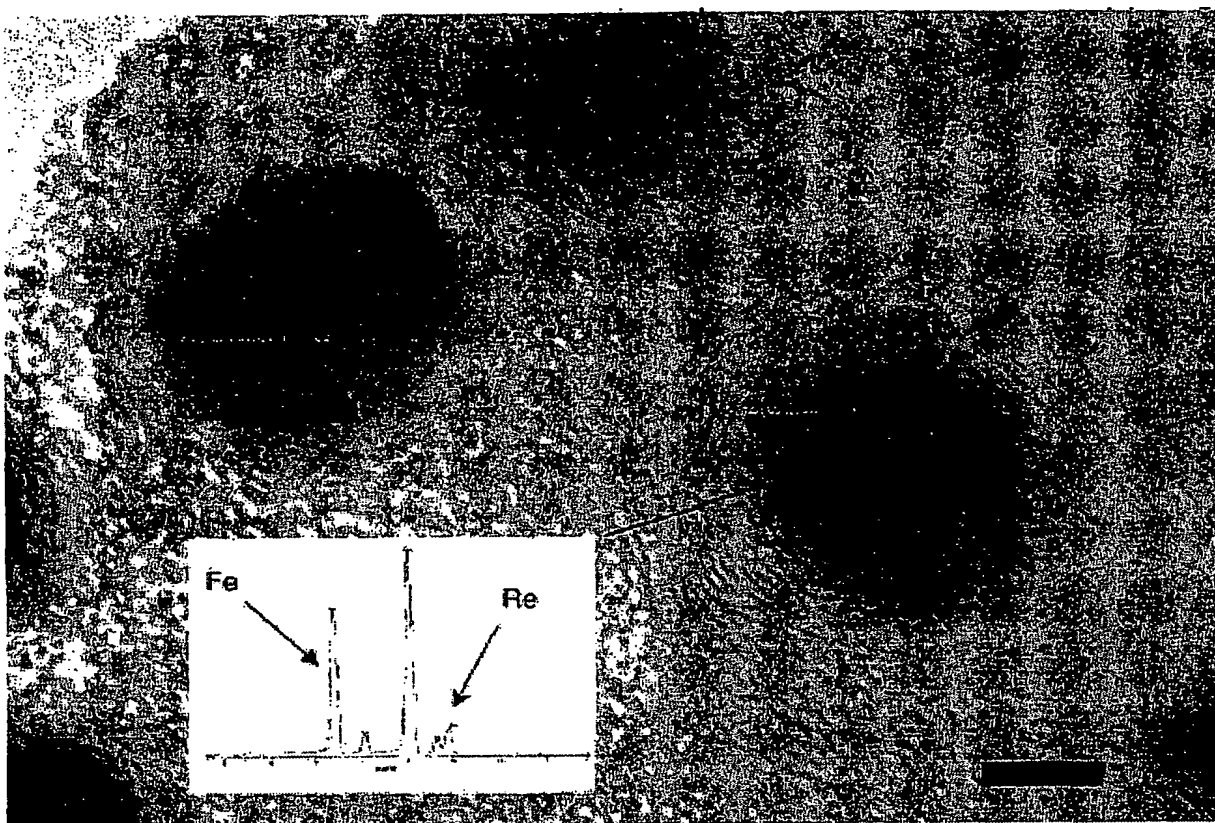
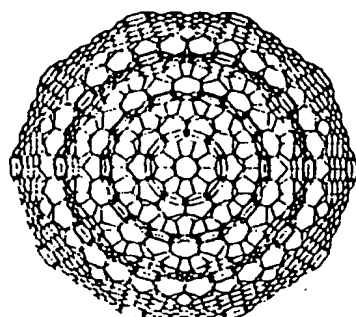


Fig. 9b

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Carbon onions

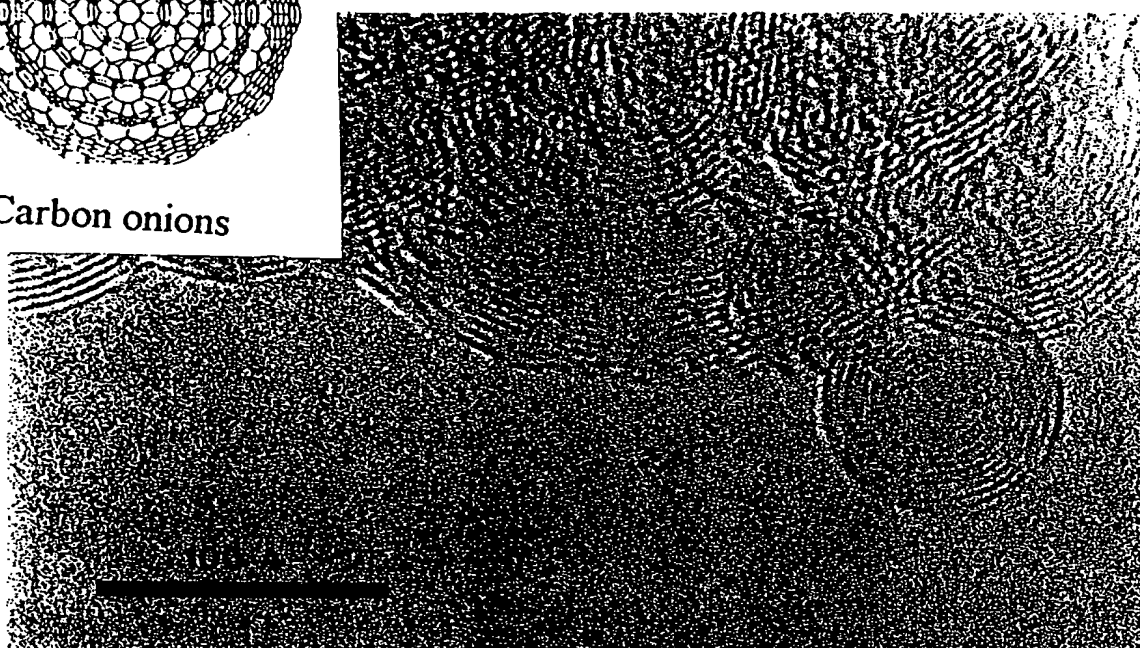


Fig. 10

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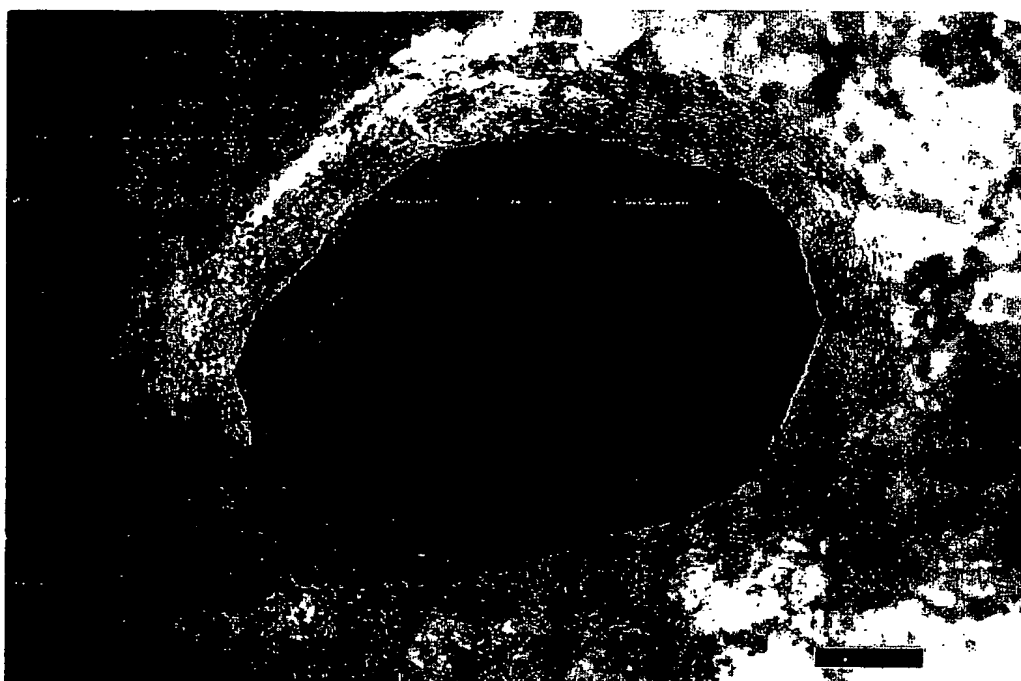


Fig. 11

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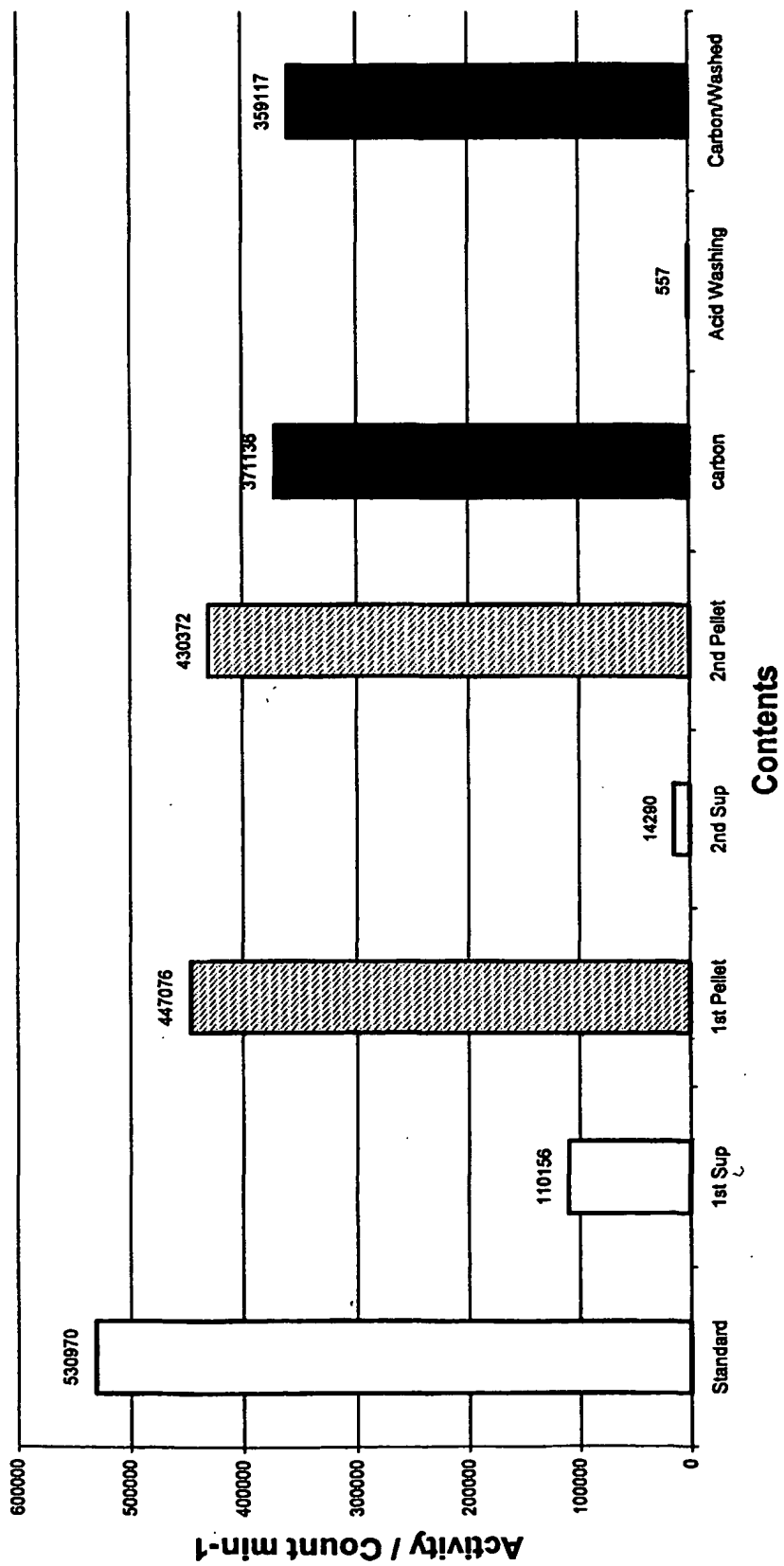


Fig. 12

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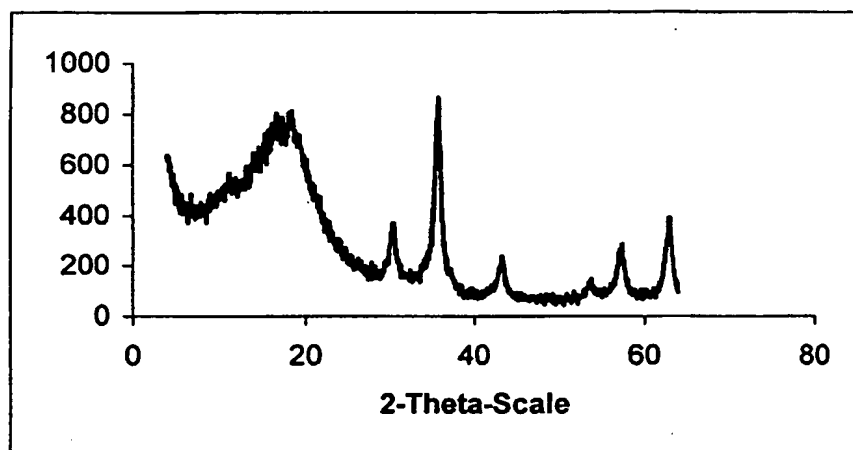


Fig. 13

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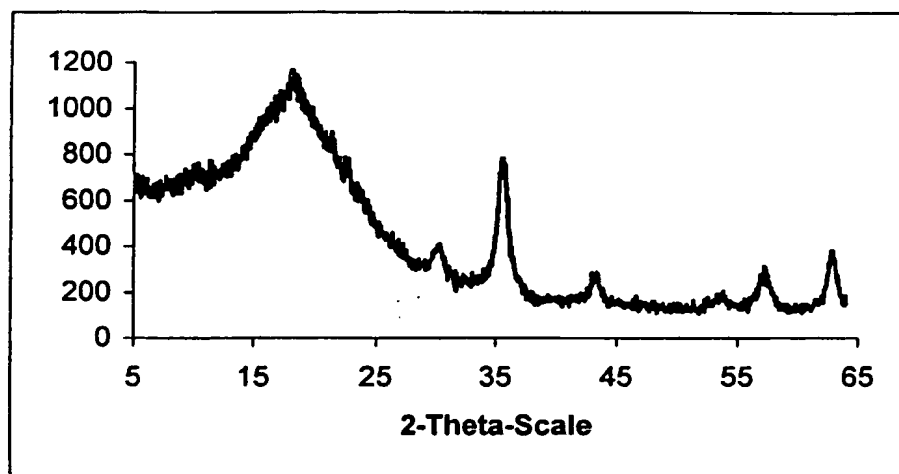


Fig. 14

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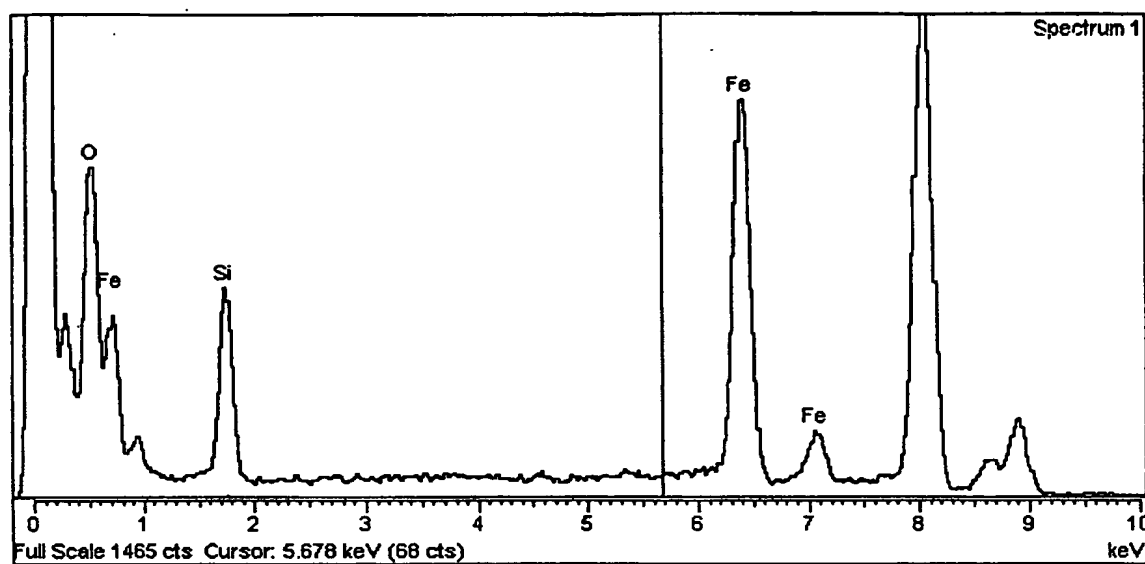


Fig. 15

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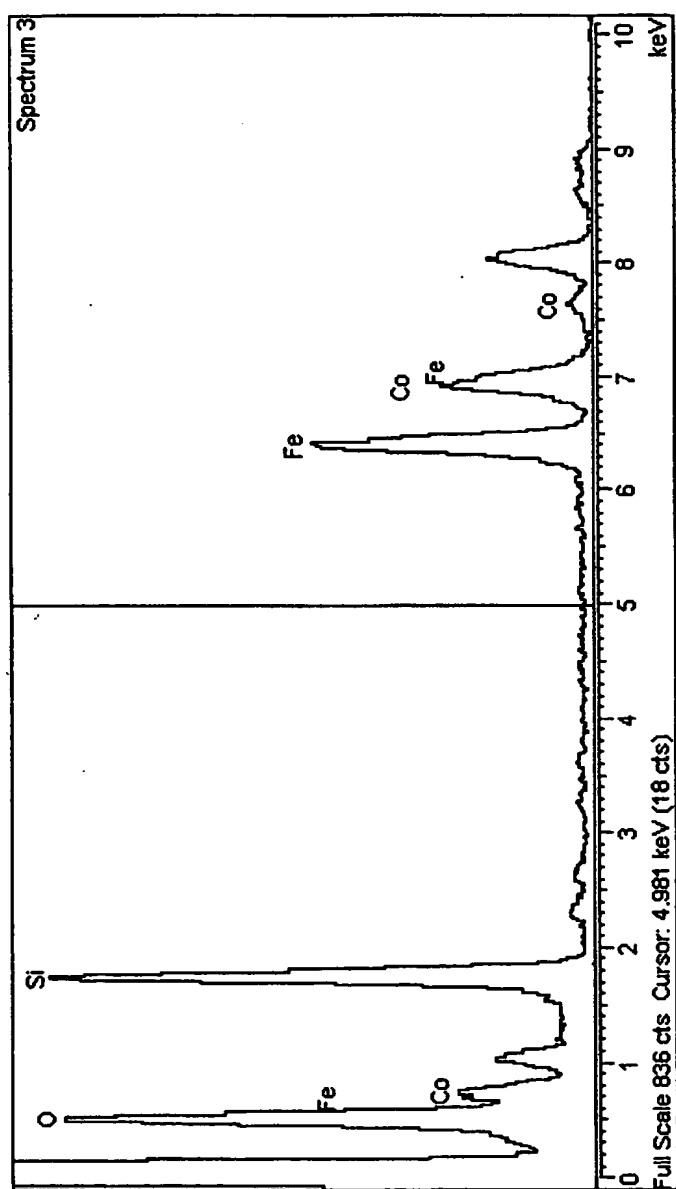


Fig. 16

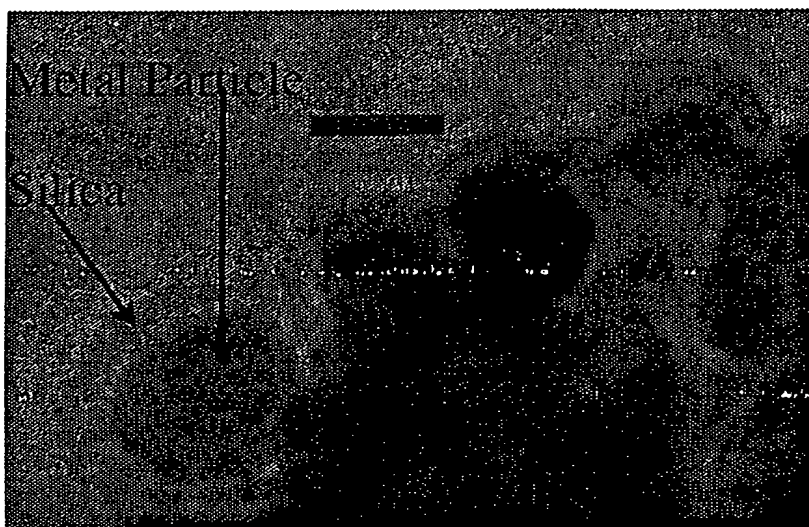


Fig. 17

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10/500842

INTERNATIONAL SEARCH REPORT

International Application No

PC., LB 03/00029

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B01J13/02 A61K9/50 C01B31/02 C09C3/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B01J A61K C01B C09C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/051766 A1 (GAZDZINSKI ROBERT F) 13 December 2001 (2001-12-13) paragraphs [0034]-[0037], [0284]-[0297]	12, 13
Y	paragraph [0292]	13
X	WO 02 00192 A (CARBON MEDICAL TECHNOLOGIES IN) 3 January 2002 (2002-01-03) page 2, line 27 - page 3, line 5 page 3, line 15 - line 27 page 4, line 9 - line 16 page 4, line 26 - line 30 page 9, line 25 - page 10, line 22 page 11, line 10 - line 19 page 12, line 9 - line 12 page 12, line 20 - page 13, line 27	1-15
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Date of the actual completion of the international search

10 April 2003

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International Application No

PC., JB 03/00029

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 472 749 A (HWANG J-H ET AL) 5 December 1995 (1995-12-05) column 1, line 26 -column 2, line 13 ---	1-15
A	GADD G E ET AL: "The encapsulation of Ni in graphitic layers using C60 as a precursor" CARBON, XX, XX, vol. 39, no. 12, October 2001 (2001-10), pages 1769-1787, XP004299747 ISSN: 0008-6223 the whole document ---	1-15
Y	US 6 009 457 A (MOLLER MATTHEW DONALDSON) 28 December 1999 (1999-12-28) column 5, line 7-14 column 6, line 14 - line 26 column 6, line 50 -column 8, line 6 column 9, line 30 -column 10, line 18 column 11, line 40 - line 52 column 15, line 15 -column 44, line 43 -----	13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 03/00029

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

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because they relate to subject matter not required to be searched by this Authority, namely:
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3. ☐ Claims Nos.:
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Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
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1-15

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-15

The method for encapsulating metal species in a graphitic shell according to claims 1 to 11 and microcapsules with a graphitic shell according to claims 12 to 15

2. Claims: 16-28

The method for encapsulating metal-species in a silica shell according to claims 16 to 22 and microcapsules with a silica shell according to claims 23 to 28.

INTERNATIONAL SEARCH REPORT

International Application No

PC., JB 03/00029

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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